

## WHAT IS CLAIMED IS:

- 1           1. A method of sensing temperature comprising:  
2           providing a temperature sensor including a matrix on a surface of a substrate, the  
3           matrix comprising a semiconductor nanocrystal in a binder;  
4           irradiating a portion of the sensor with an excitation wavelength of light;  
5           detecting emission of light from the sensor; and  
6           determining the temperature from the emission of light from the sensor.
- 1           2. The method of claim 1, wherein the semiconductive nanocrystal includes a group  
2           II-VI semiconductor, a group III-V semiconductor, or group IV semiconductor.
- 1           3. The method of claim 1, wherein the semiconductor nanocrystal is ZnS, ZnSe,  
2           ZnTe, CdS, CdSe, CdTe, HgS, HgSe, HgTe, AlN, AlP, AlAs, AlSb, GaN, GaP, GaAs, GaSb,  
3           InN, InP, InAs, InSb, TiN, TiP, TiAs, TiSb or mixtures thereof.
- 1           4. The method of claim 1, wherein the semiconductor nanocrystal is overcoated with  
2           a second semiconductor material.
- 1           5. The method of claim 1, wherein the semiconductor nanocrystal includes an  
2           organic or organometallic overlayer, the overlayer making the nanocrystal soluble in the  
3           binder.
- 1           6. The method of claim 5, wherein the overlayer includes a hydrolyzable moiety.
- 1           7. The method of claim 6, wherein the hydrolyzable moiety includes a metal  
2           alkoxide.
- 1           8. The method of claim 1, wherein the binder includes an organic polymer.
- 1           9. The method of claim 1, wherein the binder includes an inorganic matrix.

1           10. The method of claim 1, wherein the nanocrystal is a member of a substantially  
2 monodisperse core population.

1           11. The method of claim 1, wherein the population emits light in a spectral range of  
2 no greater than about 75 nm full width at half max (FWHM).

1           12. The method of claim 1, wherein the population exhibits less than a 15% rms  
2 deviation in diameter of the nanocrystal.

1           13. The method of claim 1, wherein the nanocrystal photoluminesces with a quantum  
2 efficiency of at least 10%.

1           14. The method of claim 1, wherein the nanocrystal has a particle size in the range of  
2 about 15 Å to about 125 Å.

1           15. A temperature sensor comprising a matrix containing a semiconductor  
2 nanocrystal, the matrix formed from a semiconductor nanocrystal and a binder.

1           16. The sensor of claim 15, wherein the semiconductive nanocrystal includes a group  
2 II-VI semiconductor, a group III-V semiconductor, or group IV semiconductor.

1           17. The sensor of claim 15, wherein the semiconductor nanocrystal is ZnS, ZnSe,  
2 ZnTe, CdS, CdSe, CdTe, HgS, HgSe, HgTe, AlN, AlP, AlAs, AlSb, GaN, GaP, GaAs, GaSb,  
3 InN, InP, InAs, InSb, TiN, TiP, TiAs, TiSb or mixtures thereof.

1           18. The sensor of claim 15, wherein the semiconductor nanocrystal is overcoated  
2 with a second semiconductor material.

1           19. The sensor of claim 15, wherein the semiconductor nanocrystal includes an  
2 organic or organometallic overlayer, the overlayer making the nanocrystal soluble in the  
3 binder.

- 1 20. The sensor of claim 15, wherein the overlayer includes a metal alkoxide.
- 1 21. The sensor of claim 15, wherein the matrix includes an organic polymer.
- 1 22. The sensor of claim 15, wherein the matrix includes an inorganic matrix.
- 1 23. The sensor of claim 15, wherein the nanocrystal is a member of a substantially  
2 monodisperse core population.
- 1 24. A temperature-sensing coating comprising a matrix on a surface of a substrate,  
2 the matrix comprising a semiconductor nanocrystal in a binder.
- 1 25. The coating of claim 24, wherein the semiconductive nanocrystal includes a  
2 group II-VI semiconductor, a group III-V semiconductor, or group IV semiconductor.
- 1 26. The coating of claim 24, wherein the semiconductor nanocrystal is ZnS, ZnSe,  
2 ZnTe, CdS, CdSe, CdTe, HgS, HgSe, HgTe, AlN, AlP, AlAs, AlSb, GaN, GaP, GaAs, GaSb,  
3 InN, InP, InAs, InSb, TiN, TiP, TiAs, TiSb or mixtures thereof.
- 1 27. The coating of claim 24, wherein the semiconductor nanocrystal is overcoated  
2 with a second semiconductor material.
- 1 28. The coating of claim 24, wherein the semiconductor nanocrystal includes an  
2 organic or organometallic overlayer, the overlayer making the nanocrystal soluble in the  
3 binder.
- 1 29. The coating of claim 24, wherein the matrix includes an organic polymer.
- 1 30. The coating of claim 24, wherein the matrix includes an inorganic matrix.
- 1 31. The coating of claim 24, wherein the nanocrystal is a member of a substantially  
2 monodisperse core population.

1           32. A temperature-sensing paint comprising a semiconductor nanocrystal in a binder  
2 and a deposition solvent.

1           33. The paint of claim 32, wherein the semiconductor nanocrystal emits light  
2 independent of oxygen pressure and dependent upon temperature upon irradiation by an  
3 excitation wavelength of light.

1           34. The paint of claim 32, further comprising a pressure-sensitive composition, the  
2 pressure-sensitive composition emitting light dependent upon oxygen pressure upon  
3 irradiation by an excitation wavelength of light.

1           35. The paint of claim 32, wherein the pressure-sensitive composition includes a  
2 porphyrin.

1           36. The paint of claim 32, wherein the porphyrin is a platinum porphyrin.

1           37. The paint of claim 32, wherein the binder includes an organic polymer.

1           38. The paint of claim 32, wherein the binder forms an inorganic matrix.

1           39. The paint of claim 32, wherein the deposition solvent includes an alcohol.

1           40. The paint of claim 32, wherein the semiconductive nanocrystal includes a group  
2 II-VI semiconductor, a group III-V semiconductor, or group IV semiconductor.

1           41. The paint of claim 32, wherein the semiconductor nanocrystal is ZnS, ZnSe,  
2 ZnTe, CdS, CdSe, CdTe, HgS, HgSe, HgTe, AlN, AlP, AlAs, AlSb, GaN, GaP, GaAs, GaSb,  
3 InN, InP, InAs, InSb, TiN, TiP, TiAs, TiSb or mixtures thereof.

1           42. The paint of claim 32, wherein the nanocrystal is a member of a substantially  
2 monodisperse core population.

1 43. A method of manufacturing a temperature-sensing paint comprising combining a  
2 semiconductor nanocrystal, a binder, and a deposition solvent to form a paint.

1 44. The method of claim 43, further comprising preparing the semiconductor  
2 nanocrystal by contacting an M donor, M being Cd, Zn, Mg, Hg, Al, Ga, In, or Tl, with an X  
3 donor, X being O, S, Se, Te, N, P, As, or Sb to form a mixture; and heating the mixture to  
4 form the nanocrystal.

1 45. A method of manufacturing a temperature sensor, comprising:  
2 depositing a temperature-sensing paint on a surface of a substrate, the temperature-  
3 sensing paint comprising a semiconductor nanocrystal in a binder, and a deposition solvent.

1 46. The method of claim 45, wherein the semiconductive nanocrystal includes a  
2 group II-VI semiconductor, a group III-V semiconductor, or group IV semiconductor.

1 47. The method of claim 45, wherein the semiconductor nanocrystal is ZnS, ZnSe,  
2 ZnTe, CdS, CdSe, CdTe, HgS, HgSe, HgTe, AlN, AlP, AlAs, AlSb, GaN, GaP, GaAs, GaSb,  
3 InN, InP, InAs, InSb, TiN, TiP, TiAs, TiSb or mixtures thereof.

1 48. A method of sensing temperature comprising:  
2 providing a temperature sensor including a matrix on a surface of a substrate, the  
3 matrix comprising a semiconductor nanocrystal in a binder, the semiconductor nanocrystal  
4 including ZnS, ZnSe, ZnTe, CdS, CdSe, CdTe, HgS, HgSe, HgTe, AlN, AlP, AlAs, AlSb,  
5 GaN, GaP, GaAs, GaSb, InN, InP, InAs, InSb, TiN, TiP, TiAs, TiSb or mixtures thereof  
6 overcoated with a second semiconductor material and having an organic or organometallic  
7 overlayer, the overlayer making the nanocrystal soluble in the binder, the overlayer including  
8 a hydrolyzable moiety or a polymerizable moiety, the nanocrystal being a member of a  
9 substantially monodisperse core population;  
10 irradiating a portion of the sensor with an excitation wavelength of light;  
11 detecting emission of light from the sensor; and  
12 determining the temperature from the emission of light from the sensor.